

Gum-canals abundant in the petioles and leaf-bases, and in the cortex, and around the steles of the stem.

Adventitious roots borne in vertical series, triarch, with secondary wood and bast, and periderm.

Stem with leaf-bases, about 7—8 cm. in mean diameter.

Petioles about 2·5—4 cm. in diameter at base, diminishing to about 1 mm. in the ultimate branches of the rachis.

Leaflets about 3 mm. wide.

Roots reaching 12 mm. in diameter.

Locality: Hough Hill Colliery, Stalybridge, Lancashire.

Horizon: Lower Coal-measures.

Found by Messrs. G. Wild and J. Lomax, 1892–98.

“On the Nature of Electro-capillary Phenomena. I. Their Relation to the Potential Differences between Solutions.” By S. W. J. SMITH, M.A., formerly Coutts-Trotter Student of Trinity College, Cambridge; Demonstrator of Physics in the Royal College of Science, London. Communicated by Professor A. W. RÜCKER, Sec. R.S. Received January 5,—Read January 26, 1899.

(Abstract.)

1. The Lippmann-Helmholtz theory of the capillary electrometer contains two assumptions.

2. The first assumption would apply to any electrolytic cell. A deduction from it, which would apply to any cell having a large and a small electrode, is that the variation of the potential difference at the capillary electrode of an electrometer is the same as that of the applied electromotive force.

In order to trace the relation between surface tension and potential difference on the view that this first assumption is correct, it is necessary to eliminate the possible effect of depolarisation upon the form of the electro-capillary curve—*i.e.*, the curve which shows the relation between the surface tension and the applied electromotive force. A direct method of examining the depolarisation current is described and applied. An estimate of the magnitude of the depolarisation effect is given, and the circumstances under which the effect may become appreciable are discussed.

3. The second assumption of the Lippmann-Helmholtz theory, that the electro-capillary phenomena are controlled by a simple variation of the electrostatic surface energy, leads to two conclusions, each of which is beset with difficulties.

a. The form of the electro-capillary curve is remarkably dependent upon the nature and concentration of the electrolyte, and depolarisation is quite insufficient to account for the dependence.

b. The conclusion that the potential difference between the solution and the capillary electrode is zero when the surface tension has its maximum value, leads to the necessity for assuming large potential differences between certain solutions.

4. The hypothesis that the potential difference between equally concentrated solutions of potassium chloride and iodide is negligible possesses a high degree of probability. It has been shown by previous observers that if this hypothesis be true the points of maximum surface tension on the electro-capillary curves for the above solutions cannot have the significance which Helmholtz's theory gives them.

It is shown in the paper that the first hypothesis of the Lippmann-Helmholtz theory is in striking accord with this hypothesis concerning the potential difference between KCl and KI when the very definite "descending" branches of the electro-capillary curves are considered.

5. If both the hypotheses just mentioned be true, we get the result that the surface tension of mercury (for a certain range of potential differences) in two solutions is the same for a given potential difference between the mercury and the respective solutions, if the solutions are equally concentrated and possess the same kation.

6. An extension of this result shows that it is indifferent whether the kation be K, Na, or H.

7. The relation found for the KCl and KI curves can be extended to the other known cases in which the electrometer curves and liquid potential difference calculations seem to be contradictory, in such a way as to account for the apparent contradiction. Several of the cases are examined.

8. The results in 4, 5, and 6 would give a direct and accurate method of finding the potential differences between equally concentrated solutions, and could be extended to the case of solutions of different concentrations.

9. The probability that the electro-capillary curves are never completely free from influences other than electrostatic is shown by an examination of the relations between the curves for unequally concentrated solutions of the same salt.

10. In confirmation of results obtained by G. Meyer, in a slightly different way, it is shown that if the potential difference between KCl and KI is very small, the potential fall from a half normal solution of KI to a dropping electrode of the Paschen type is about a quarter of a volt greater than that from a half normal solution of KCl to the same electrode.

In the same way the potential fall from KI to mercury when the surface tension is a maximum is about a quarter of a volt greater than

that from KCl to mercury when the tension of the surface separating the solution from the mercury is a maximum.

These results follow from direct observations with dropping electrodes, and give further support to the view that the first assumption of the Lippmann-Helmholtz theory is true and that the second is not.

“The Influence of Removal of the Large Intestine and Increasing Quantities of Fat in the Diet on General Metabolism in Dogs.” By VAUGHAN HARLEY, M.D., Professor of Pathological Chemistry, University College, London. Communicated by Professor VICTOR HORSLEY, F.R.S. Received July 25,—
Read November 17, 1898.*

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Introduction.

When I commenced my investigations into the functions of the large intestine by means of experimenting with isolated loops, into which milk was injected, and after some hours again collected, I found that the analysis yielded most unsatisfactory results. In consequence, in order to get over the difficulty, it seemed better to try the effect of the removal of the large intestine on nutrition. I believed that by comparing the analysis of the urine and fæces of dogs after removal of the large intestine with that of normal dogs on precisely similar diet, the effect of the absence of the large intestine would be sufficiently clearly demonstrated, and by this means its functions would be better understood.

* Received during recess and published in abstract in this volume at p. 77 *supra*.